

### REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-9 are pending, with Claims 1-3, 5, 6 and 7 amended and Claims 8-9 added by the present amendment.

In the Official Action, Claim 7 was rejected under 35 U.S.C. § 101; and Claims 1-7 were rejected under 35 U.S.C. § 102(b) as being anticipated by Nishikawa et al. (U.S. Patent No. 6,058,322, hereinafter Nishikawa).

Claims 1, 6 and 7 are amended to more clearly describe and distinctly claim Applicants' invention. Support for this amendment is found in Applicants' originally filed specification.<sup>1</sup> Claim 7 is further amended to comply with 35 U.S.C. § 101. No new matter is added.

Applicants acknowledge with appreciation the personal interview between the Examiner and Applicants' representative on April 25, 2007. During the interview, the claimed invention was contrasted with conventional neural networks of Nishikawa. The Examiner acknowledged that the neural networks of Nishikawa do not perform non-parametric smoothing as recited in Applicants' original Claim 1. Applicants have further clarified the claimed invention and submit that the neural networks of Nishikawa do not perform non-parametric smoothing of extracted data over a database of previously stored feature data with one of a fixed or adaptive kernel, K, the adaptive kernel being wider in a region where the extracted data are more sparse, narrower in a region where the extracted data are more dense.

Briefly recapitulating, Claim 1 is directed to a method of analyzing a medical image to determine information concerning a disease that may be evidenced by a lesion in the

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<sup>1</sup> Specification paragraph [0040]-[0045].

medical image. Claim 7 is directed to a computer readable storage medium. Claims 1 and 7 each recite:

extracting data corresponding to at least one feature of the lesion from the medical image; and  
determining the information concerning the disease, based on non-parametric smoothing of the extracted data over a database of previously stored feature data with one of a fixed or adaptive kernel, K, the adaptive kernel being wider in a region where the extracted data are more sparse, narrower in a region where the extracted data are more dense.

Claim 6 recites a processor configured to determine the information concerning the disease, based on non-parametric smoothing of the extracted data over a database of previously stored feature data with one of a fixed or adaptive kernel, K, the adaptive kernel being wider in a region where the extracted data are more sparse, narrower in a region where the extracted data are more dense.

Nishikawa describes a method and system for detecting, classifying and displaying abnormal anatomic regions existing in digital medical images, such as mammograms and chest radiographs, including methods for feature extraction. In one embodiment of Nishikawa, a microcalcification is delineated from a mammogram, and its size and contrast are measured. A mean and relative standard deviation is used as features for the classification of the microcalcifications.<sup>2</sup>

Nishikawa uses a artificial neural network (ANN) to classify individual and clustered microcalcifications via a feed forward, error back propagation network with three layers. The input layer has eight input units, each reading one of the eight features shown in Table 1. A numerical value of each feature is normalized to between 0 and 1 so that the maximum of features in the data set is 1. A single hidden layer has six hidden units, as determined

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<sup>2</sup> Nishikawa col. 17, lines 6-20.

empirically for optimal network performance. The output layer has a single output unit. The output of the ANN can be transformed to an estimate of likelihood of malignancy.<sup>3</sup>

As noted in Nishikawa, an artificial neural network is a mathematical model of the human neural system. Artificial neural networks are generally applied to multi-variate problems (such as the analysis of eight features of microcalcifications), where it is difficult to develop a simple decision rule. An artificial neural network solves multi-variate problems by forming a multi-variable (weights) mathematical model on the basis of examples, and then applying this model to realistic cases.

Nishikawa is an example of Applicants' conventional neural network without non-parametric classification. The ANN of Nishikawa does not determine the information concerning the disease, based on non-parametric smoothing of the extracted data over a database of previously stored feature data with one of a fixed or adaptive kernel, K, the adaptive kernel being wider in a region where the extracted data are more sparse, narrower in a region where the extracted data are more dense. As noted in Applicants' specification, classifiers such as linear discriminant analysis *or artificial neural networks* have limitations especially in a limited training database situation. For example, artificial neural networks tend to be complex and difficult to model. However, Applicants' non-parametric classification can be applied to the various tasks in CAD to improve the use of computerized image analysis in medical imaging by optimizing the computer output. As noted in Applicants' specification, Applicants' non-parametric classifiers improve characterization of the lesion, image, and/or disease status, especially when limited databases for training neural networks are available.<sup>4</sup>

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<sup>3</sup> Nishikawa col. 20, lines 26-39.

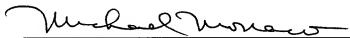
<sup>4</sup> Specification, paragraphs [0036-0037].

MPEP § 2131 notes that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See also MPEP § 2131.02. “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Because Nishikawa does not disclose or suggest all the features recited in Claims 1, 6 and 7, Nishikawa does not anticipate the invention recited in Claims 1, 6 and 7, and all claims depending therefrom.

Accordingly, in view of the present amendment and in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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